A RODENT-HUMAN SENSORIMOTOR OUTCOMES MATRIX: OVERLAP AND GAPS

David Magnuson, PhD, University of Louisville

For the team!

Spinal Cord Outcomes SCOPE Partnership Endeavor

ACKNOWLEDGMENTS

Sponsored by:

Thomas Jefferson University

Office of the Provost

and the

Center for Outcomes and Measurement in Jefferson College of Rehabilitation Sciences

THE GANG

MJ Mulcahey, OT, PhD
Thomas Jefferson University
Clinical

Karim Fouad, PhD
University of Alberta
Pre-clinical

Linda Jones, PT, PhD
University of Colorado
Clinical

Edelle Field-Fote, PT, PhD
Shepherd Center
Clinical

Michele Basso, PT, EdD
The Ohio State University
Clinical and pre-clinical

David Magnuson, PhD
University of Louisville
Pre-clinical

Veronica Tom, PhD
Drexel University
Pre-clinical

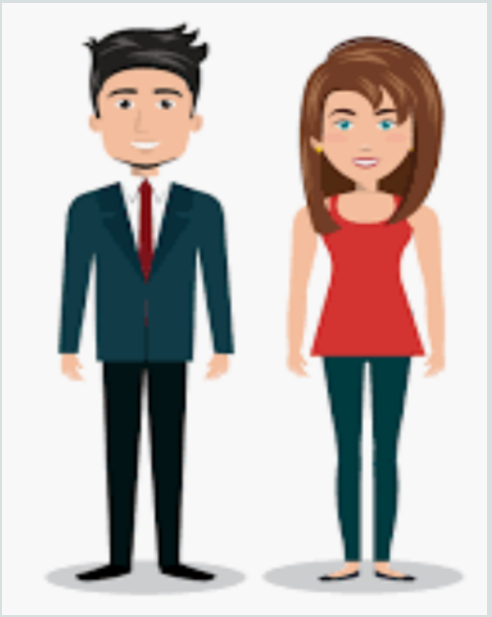
OBJECTIVES

- Identify alignment and gaps between preclinical and clinical outcome measures.
- Consider the differences and similarities in animal and human outcome measures when planning pre-clinical and clinical studies.
- Promote a better understanding of outcomes of animal and human research studies.
- Encourage bi-directional communication to promote success of translational research

INTRODUCTION

Outcome measures

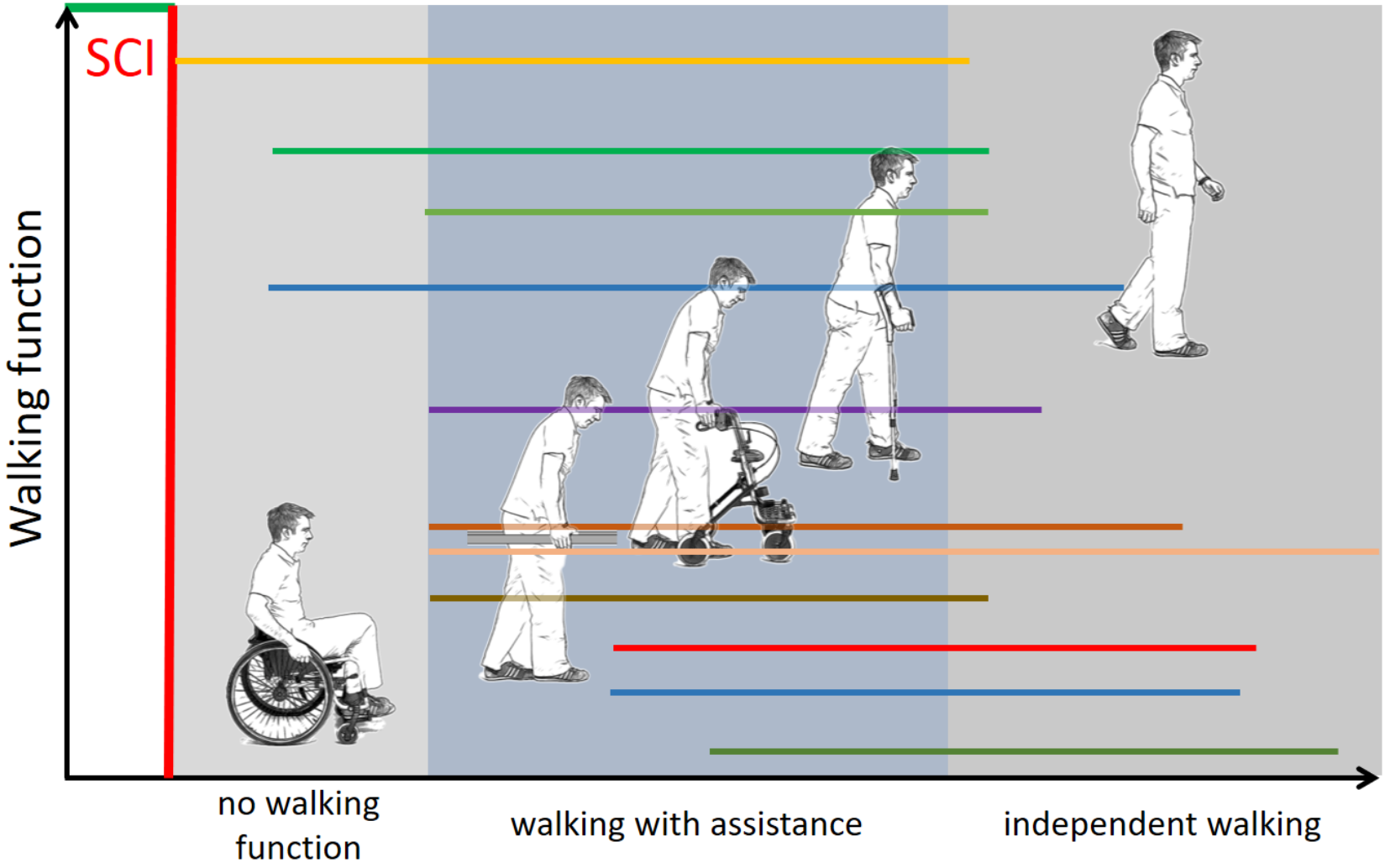
?



METHODS

- Expert small group consensus
- Focus on sensorimotor, **motor and locomotor** outcomes to limit the scope
- Approach was by construct of each measure (vs. specifics)
- Separated groups by upper extremity/limb and lower extremity/limb
- Focused on most common measures
  - Clinical – NINDS CDES
- Animal to human, then human to animal

LOWER EXTREMITY- HUMAN



Strength - myotomal
International Standards for the Neurological Classification of SCI -ISNCSCI

Walking ability (with compensation)
Spinal Cord Independance Measure - SCIM III
(transfers, walk- distance, assistance, device)
Walking Index for SCI II – assist., device

Walking ability (w/o compensation)
Neuromuscular Recovery Scale - NRS
(sit, stand, walk- parameters, adaptiblity, speed)

Walking ability/ gait parameters
SCI Functional Ambulation Inventory
(gait parameters, device, distance)

Gait quality and parameters
Instrumented walkway
Kinematics

Balance - Berg Balance Scale

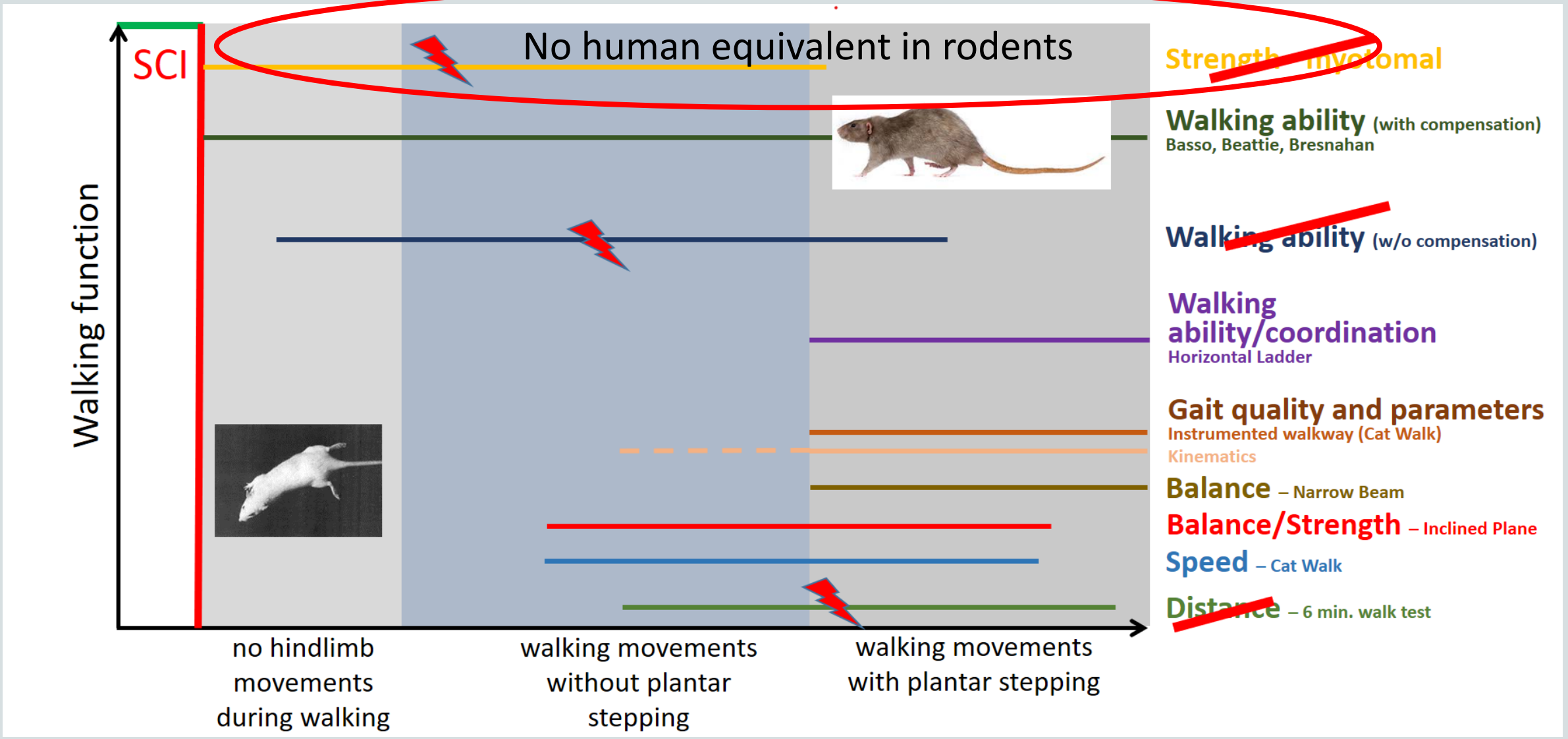
Balance/Mobility- Timed Up and Go

Speed - 10 meter walk test

Distance – 6 min. walk test

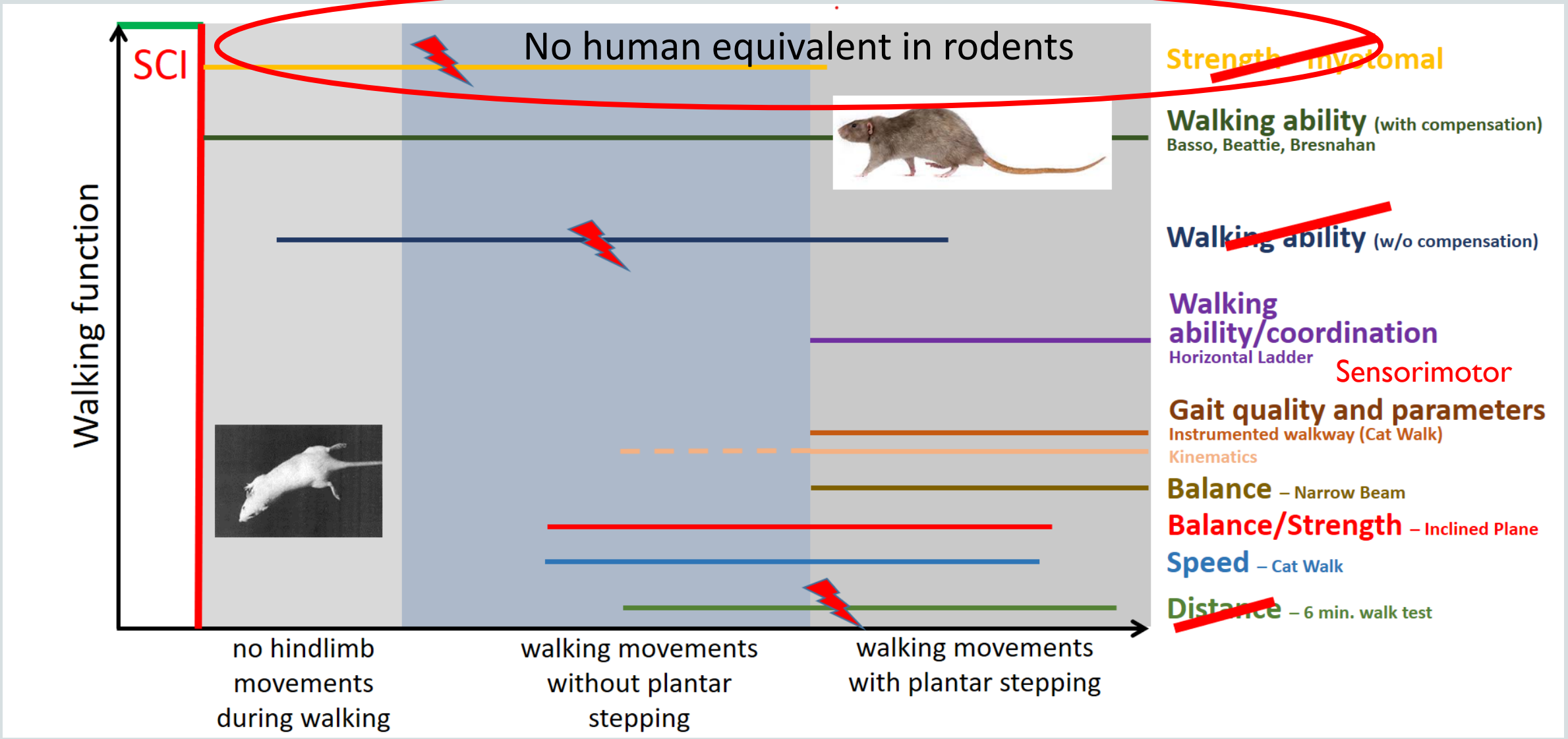
*Modified based on image provided by Marc Bolliger from: Lower extremity outcome measures: considerations for clinical trials in spinal cord injury. Bolliger, et al. Spinal Cord. 2018; 56:628-642.

LOWER LIMB - RODENT



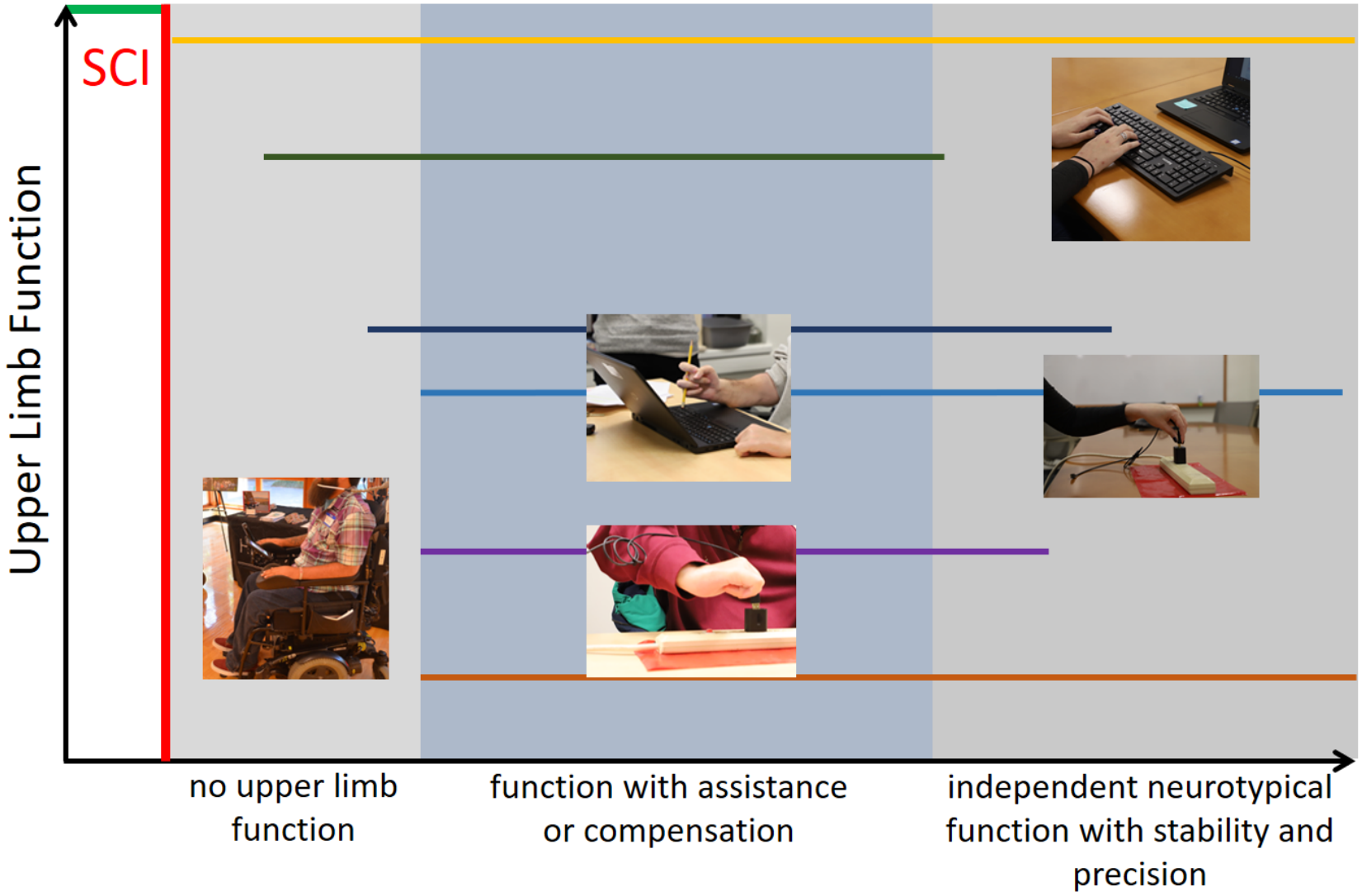
= construct has no human equivalent in rodents

LOWER LIMB - RODENT



= construct has no human equivalent in rodents

HUMAN UPPER EXTREMITY



Strength - myotomal
International Standards for the Neurological Classification of SCI -ISNCSCI

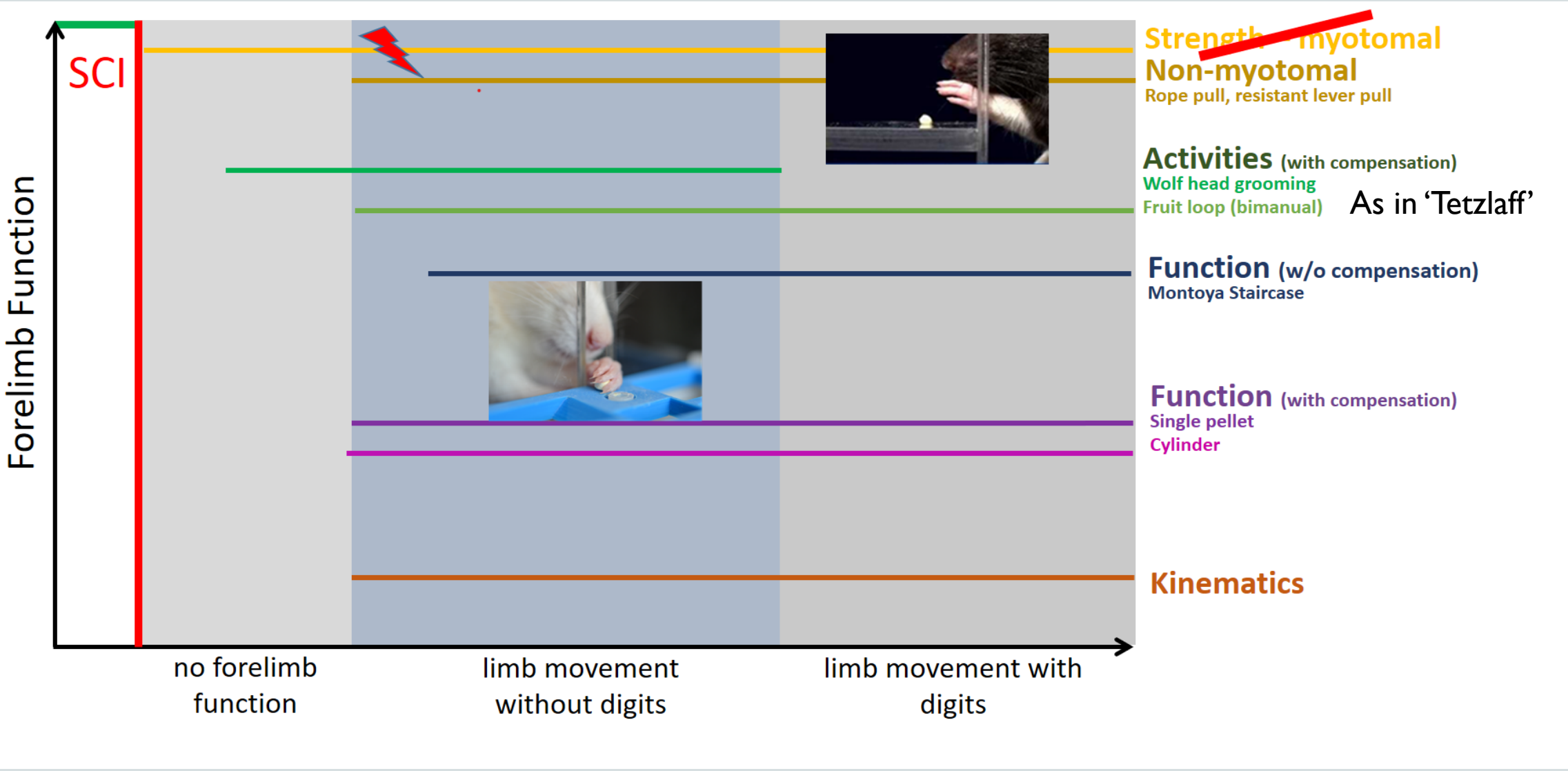
Activities (with compensation)
Spinal Cord Independance Measure - SCIM III
feeding, bathing, grooming

Function (w/o compensation)
Neuromuscular Recovery Scale
reach &grasp, door open/pull, overhead press
Capabilities of Upper Extremity Test
unilateral & bi-manual, proximal & distal

Hand Impairment & Prehension (with compensation)
Graded Redefined Assessment of Strength, Sensibility and Prehension

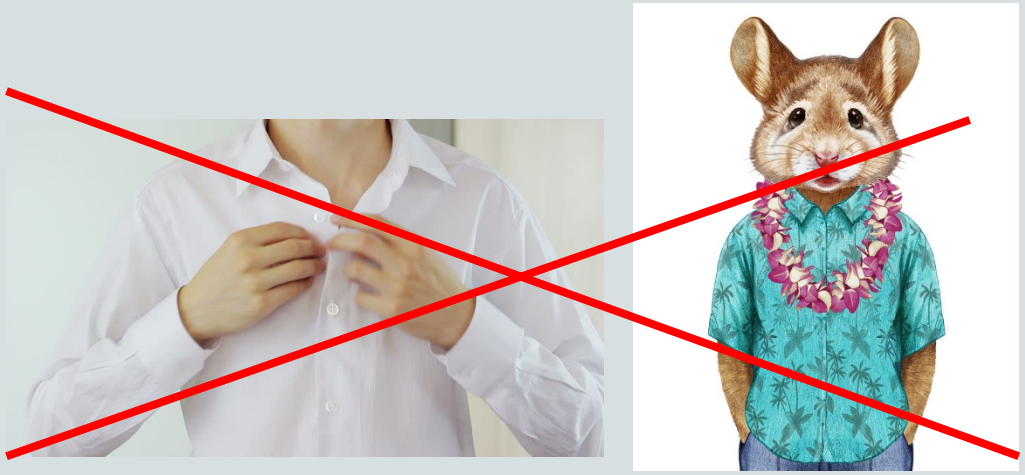
Kinematics
Rarely used for upper extremity

RODENT FORELIMB FUNCTION



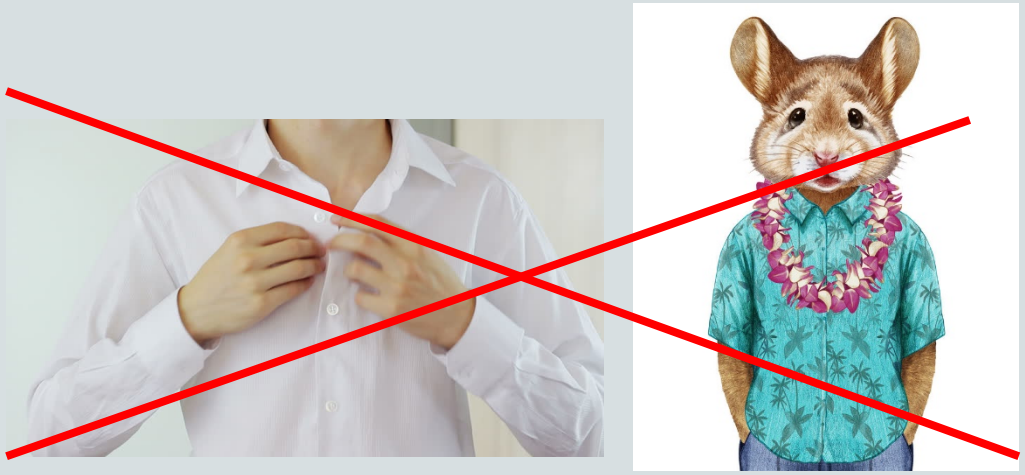
A FEW TAKEAWAYS

- Development and assessment of measures differs in pre-clinical vs. clinical communities
  - Reliability and validity
  - In humans – common outcome is motor score and/or neurological level of injury (impairment) and walking distance
  - In animals there is no equivalent and assessments are based on function
- Some areas of alignment – walking ability/gait parameters
  - BBB and SCI-FAI?
- Key opportunities are functional outcomes that do not require executive function
- Kinematics & Gait?



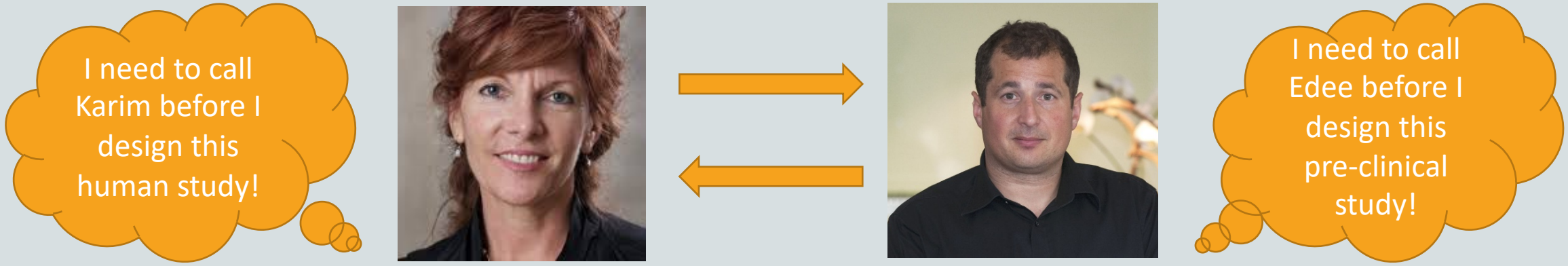
A FEW TAKEAWAYS

- Development and assessment of measures differs in pre-clinical vs. clinical communities
  - Reliability and validity
  - In humans – common outcome is motor score and/or neurological level of injury (impairment) and walking distance
  - In animals there is no equivalent and assessments are based on function – can't get a rat to do a voluntary mvt
- Some areas of alignment – walking ability/gait parameters
  - BBB and SCI-FAI?
- Key opportunities are functional outcomes that do not require executive function
- Kinematics & Gait?



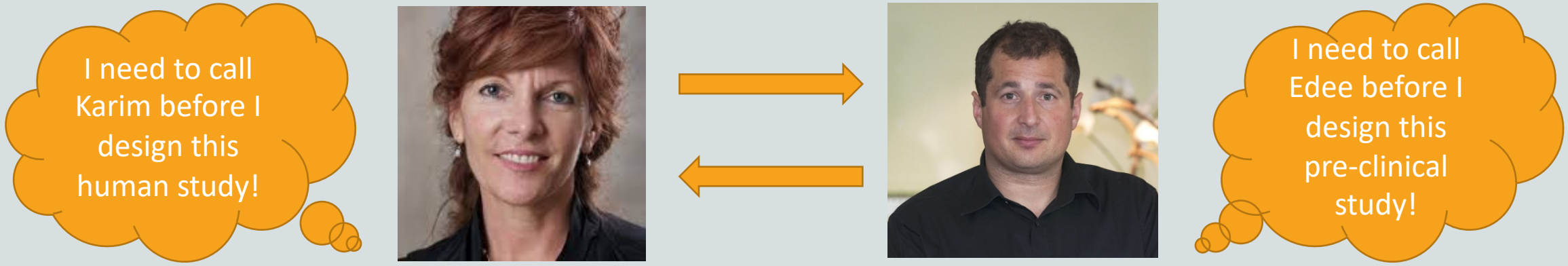
NEXT STEPS

- Once gaps and similarities identified, how to improve study designs?
  - Can we use existing measures that may reflect bi-directional translational outcomes?
  - Do we need to modify existing measures?
  - Develop new, more analogous measures?
- Use animal and human data to analyze similarities and differences?
- Early, bi-directional communication



ULTIMATE DELIVERABLES

- Publications: 1) UE and LE matrix, 2) Larger issues & outcome/model development.
- A clearer alignment of clinical and pre-clinical measures in terms of underlying construct assessed
- This will improve “flow” and clarity of bench to bedside and bedside to bench research
- Contribute to overall Common Data Elements endeavors.



THANK YOU